

# NEUROPEPTIDES, EMOTIONS AND THE BODYMIND

*Dr Candace Pert's research, showing the action of neuropeptides and their receptors in storing emotions and memories, helps explain the therapeutic value of various forms of bodywork.*

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Canberra, ACT  
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**M**oshe Feldenkrais was a genius way ahead of his time when he wrote in 1964: "My contention is that the unity of mind and body is an objective reality, that they are not entities related to each other in one fashion or another, but an inseparable whole while functioning. To put the point more clearly I contend that a brain without motor functions could not think, or at least that the continuity of mental functions is assured by corresponding motor functions."

Feldenkrais went on to say that we have no sensation of the inner workings of the central nervous system, but feel their manifestation only as far as sensations from the body provoke our awareness. This is the state of consciousness! He concluded that "...the state of the [cerebral] cortex is directly and legibly visible on the periphery through the attitude, posture and muscular configuration, which are all connected. Any change in the nervous system translates itself clearly through a change of attitude, posture and muscular configuration. They are not two states, but two aspects of the same state."

This hypothetical stance taken by Feldenkrais—that the mind and body are one—was substantiated by the practical work he had been exploring for 30 years to assist people to move more easily. It was shared by a pioneering group of thinker-explorers of the 20th century—among them F. Matthias Alexander, Ida Rolf, Gerda Alexander and Elsa Gindler—who were interested in finding practical ways of furthering human development.

However, the most significant breakthrough in our scientific understanding of the body-mind did not come until the early 1970s, when Dr Candace Pert discovered and measured the opiate receptor and thus launched her career as a distinguished bench scientist. Before that, a receptor was mostly an idea: a hypothetical site believed to be located in the cells of all living things. The scientists who most needed to believe in receptors were pharmacologists, because it was the only way they knew to explain the action of drugs.

Since her first discovery, Dr Pert and her colleagues have gone on to specify, measure and map a wide variety of molecules (receptors) embedded in the membranes of neurons and other cells in the body (e.g., muscle, lung, gut, glandular and immune system cells), whose functions are different from other receptors in cell membranes. When all are discovered, Pert expects there will be around 300 neuropeptides, all with different actions on individual cells and on overall behaviour.

It would not be an exaggeration to say that the scientists have discovered a "second nervous system", equally as important as the first. Neuroscience had long been focused on the concept of the nervous system as an electrical network with neurotransmitters at synapses allowing electrical impulses to pass from neuron to neuron. Dr Pert now says that only about 2% of communication within the brain occurs via synapses and 98% by information molecules such as hormones and neuropeptides, which act over longer distances.

The binding of an information molecule (ligand) to a receptor is like a key fitting into a keyhole. Both molecules are vibrating, and there seems to be an attractive force between the receptor and its appropriate ligand (usually a neuropeptide). When the two fit together, information enters the cell and directs its activities by initiating a cascade of biochemical events. The cell may begin any number of activities, e.g., building new proteins, opening and closing ion channels, or division. Each cell may have millions of receptors on its surface, with hundreds of thousands of the same type. The activity of the cell and its functional relationship with the rest of the body depends on the density of particular receptors on the cell surface and on how many of these contain neuropeptides at a particular time. On a macro scale, these minute physiological phenomena at the cellular level can translate into large changes in behaviour, physical activity and even mood.

## MOLECULES OF EMOTION

Dr Pert has called the neuropeptides and their receptors "molecules of emotion". The information-carrying peptide molecules circulate freely about the body in the cerebrospinal fluid, blood and other extracellular fluids, and their action at specific receptor sites on cells connects not only various organs and biological processes but also mental and physical states. When our emotions cause us to go red in the face or to sweat, these effects are not responses to messages from the brain. Rather, they are produced directly at the cellular level when neuropeptides bind to their receptors. This is what makes both neuropeptides and their receptors "molecules of emotion". Different cells and tissues in the body produce greater or lesser amounts of particular peptides. A classic example of tissues that produce peptides that cause certain strong feelings and emotions would be the ovaries and testes.

The natural substances that bind to the opiate receptors are enkephalins or endorphins (depending on whether you are British or American). These are natural opiates and are shot out into the circulation after severe trauma, such as burns, to deaden the pain immediately. They are produced in smaller amounts in athletes, e.g., the so-called "runner's high" experienced by marathon runners. Opiates are also circulating freely when we are in a state of well-being, or in a rare state of sheer bliss!

This constant, changing flow of molecular information throughout the body occurs mainly outside our conscious awareness. We become aware of something happening only when we feel moods and emotions, but this is only a fraction of the activity going on—which helps explain why the source of psychosomatic ailments such as irritable colon are attributed to the subconscious mind.

In establishing the biomolecular basis for emotions, Pert demonstrated convincingly—in a way that no one has done before—that body and mind are one. An important spin-off of the research is the provision of a basis for answering the question, "How is it that some bodywork modalities are able to be of such enormous therapeutic value?"

The answer to the debate that has been raging for many years—whether emotions, drives and feelings originate in the brain or in other tissues of the body—lies in understanding how the brain and body interact to produce both visceral (or involuntary) physiological states and the experience of emotions. According to Eckhart Tolle, emotion arises at the place where mind and body meet, and could be defined as the body's reaction to the mind.

The research of Dr Candace Pert and her colleagues shows that neuropeptide interactions take place in both directions. Every change in the physiological state is accompanied by a change in the mental emotional state, conscious or unconscious; and conversely, every change in the emotional state is accompanied by a change in the physiological state. The regulator of this process—the place where mind and body meet—is known by some as the *limbic system*.

## THE LIMBIC SYSTEM

The limbic system or "emotional brain" is that part of the brain concerned with emotions and memory response. Although there is not complete agreement on the definition and structure of the

limbic system, it is generally considered that its main parts are paired structures located medially in the forebrain. It encircles the upper part of the brain stem, and lies strategically between the lower (brain stem) and the higher (cognitive) regions of the brain. It is the area through which all sensory information coming up through the spinal cord enters the brain, and through which all motor commands flow back downward. It is also the centre through which information from all the special sense organs of the cranium enters the brain. The more important clusters of neurons (called *nuclei*) generally considered to be part of the limbic system include the amygdala, cingulate gyrus, hippocampus and the hypothalamus. The two parts especially concerned with emotions are the amygdala and the cingulate gyrus.

Extensive connections between the limbic system and lower and higher brain regions allow the system to integrate and respond to a wide variety of environmental stimuli; e.g., the amygdala in the anterior temporal lobe of each cerebral hemisphere receives input from sensory areas and sends messages to the rest of the limbic system to produce emotional arousal. This activity cascades into the hypothalamus and, from there, it is connected through dense nerve and capillary networks to the pituitary gland and, in turn, to the autonomic nervous system. (The autonomic

nervous system is that part of the nervous system that regulates involuntary function, including activity of cardiac muscle, smooth muscle of the gut and bronchioles, and glandular secretion. It has two divisions: the sympathetic nervous system, which, among other things, accelerates heart rate, constricts blood vessels, raises blood pressure and is concerned in the "flight or fight" mechanism; and its opposite number, the parasympathetic nervous system, which slows heart rate, increases intestinal peristalsis and gland activity, relaxes sphincters, etc.)

Because the hypothalamus is both a command centre for the autonomic nervous system and a centre for emotional response, it is not surprising that emotional stress or overload can lead to psychosomatic illness. Parts of the limbic system are also closely connected with the (cognitive) prefrontal lobes of the cerebral hemispheres, so it is also not surprising that there is an intimate relationship between our thoughts (mediated by the cognitive brain) and our feelings (mediated by the emotional brain). The two-way communication between cognitive and emotional regions explains why sometimes emotions override logic, and why sometimes reason overrides the desire to express emotions.

The limbic system or emotional brain has the densest collection of neuropeptide bonding sites in the brain. Neurons in these areas can manufacture, send and receive every one of the neuropeptides now known. Each neuron can display millions of neuropeptide receptors on its membrane at any given time and can change the populations of specific types of receptors displayed, according to either previous stimuli or current needs.

Concentrations of neuropeptide receptors are especially dense in areas where sensory information enters the brain, and where motor connections are distributed to both skeletal and autonomic muscular systems. Our deepest convictions—those that unconsciously structure all of our individual experience and behaviour—are products of the limbic system.

The blood delivers neuropeptides secreted by the brain to their

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target cells in different and distant tissues, and carries neuropeptides secreted by these tissues to other targets and back to the brain. The limbic system is where chemical information from its neurons and from the blood (matter) connects with electrical nerve impulses in the brain (mind), and where the true union between mind and matter takes place.

A cell or organ in the body requires some sort of response to its activity to coordinate it with other systems. It synthesises and secretes appropriate messenger neuropeptides, which are carried in the blood to the limbic system. These bond to receptors on specific neurons, where they alter the neurons' internal chemical activity, neuropeptide secretion and pattern of activity in the brain. The original cell or organ is then answered, both by neuropeptides from the brain delivered by the blood and by nerve impulses directly through the nervous system. Both responses are then integrated by the cell or organ prior to its next response. Thus, the question is not one of mind versus matter, but of both being part of a whole. Physical events are translated into feeling states, and feeling states are translated into physical responses of all kinds, conscious and unconscious. Candace Pert observes: "Emotions are at the nexus between matter and mind, going back and forth between the two and influencing both."

## HABITUAL MUSCULAR PATTERNS

One of the major impacts of shifting emotions and their underlying neuropeptide chemistry is on our muscles. Without conscious awareness, everything we do with our muscles relies on habit patterns. As well as performing numerous motor functions, muscles are themselves sense organs, contributing enormously to our body image and sense of the environment. Changes in feeling-states create changes in motor performance. As Dr Deane Juhan says: "Our emotions are constantly leaking into all our muscular activities, and are either enhancing or debilitating our performance on every level." We can suppress large portions of those feelings, which will disrupt that awareness and regulation; or we can fixate on patterns of behaviour that favour the dominance of one feeling state over all the others, which limits our available responses and strategies for adapting.

As well as affecting our movements and behaviour, emotions become set in our shape or posture, as Stanley Keleman demonstrated so elegantly in 1985. He says that uprightness, the mark of human development, is altered by insults, challenges and assaults, and that one's shape is changed by one's emotional history. Keleman wrote: "Insults and shocks, stress and distress are imprinted on every cell, creating a somatic, emotional, psychological image that is enmeshed with all the events of life." He believes that distress creates contractions or weaknesses that distort "pulsation", and that somatic education brings people into the living foundations of existence—the "pulsatory waves" that generate excitement, feeling, thinking and action.

Since we now know that emotional expression is always tied to a specific flow of neuropeptides, it is possible that the chronic suppression of emotions can result in massive disturbance of the psychosomatic network, leading to immunodeficiency and disease.

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mimicked by the state of the immune system, that repressed emotions are stored in the body—the unconscious mind—by means of neuropeptides, and that memories are stored in neuropeptide receptors.

## INSIGHTS FOR EFFECTIVE BODYWORK

The neuropeptide system is highly variable and adaptable, using the language of emotions to generate all kinds of self-awareness and opportunities for self-regulation. Getting in conscious touch with tissues that are storing emotions in the form of combinations of neuropeptides, particularly muscles, and producing feelings that are healing are what effective bodywork is about. Pert's work offers scientific insight into how bodywork modalities such as Trager, body psychotherapy, bodymind centring, body transformation and craniosacral therapy accomplish their therapeutic effects, often by causing somatic-emotional release, and provides a framework for further improvement.

In the Trager approach, the practitioner enters a meditative state (or "hook-up", as coined by Dr Milton Trager) and invites the client to be in that state with him. Only when both are in this meditative state can the practitioner make suggestions to the client in the language of touch and can his message be adequately received. The idea of touch as a language is absolutely essential to understanding how the Trager approach can accomplish what it

does—how "hook-up", and everything that goes with it, can be transferred from one individual to another.

Hook-up is a very specific feeling, or "neuropeptide cocktail", characterised by very specific sensations—peace, lightness, agelessness, etc. The light, pleasurable shimmer of tissue creates the sensory foundation of the feeling state of hook-up, and the brain enters an alpha-brainwave state. Dr Trager said that hook-up neutralises the effects of chronic stress and restores the mind and the body to a condition of rest, repair, long-term

maintenance and relaxed awareness.

Dr Trager was very much against what he called "efforting". Effort causes tension, and tension causes pain and injury. In Trager, repetitive light, gentle and nonintrusive movements are used to facilitate the release of deep-seated mental and physical patterns, including emotional traumas. Like the Feldenkrais method, the Trager approach reaches the unconscious mind, rather than the body, to produce changes in the bodymind. Every touch, every movement, every gesture of the practitioner is intended to reach the mind.

Milton Trager said: "I am convinced that for every physical non-yielding condition, there is a psychic counterpart in the unconscious mind corresponding exactly to the degree of the physical manifestation. These patterns often develop in response to adverse circumstances such as accidents, surgery, illness, poor posture, emotional trauma, stresses of daily living, or poor movement habits. The purpose of my work is to break up these sensory and mental patterns which inhibit free movement and cause pain and disruption of normal function."

In the Trager approach, the feeling quality first enters the client's system as sensations. Sensations act as analogues for feelings and, according to Dr Juhan's interpretation of Candace Pert's work: "The shift from sensation to an emotional feeling quality is the transduction of a train of nerve impulses into a

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reinforcing neuropeptide release and distribution. As the process continues, contacts imparted by the practitioner stimulate more and more peptide release that corresponds to the emotional quality projected by the quality of touch." Eventually the client ends up in a feeling state—a "neuropeptide bath"—that is more like that of the practitioner. According to Juhan, this feeling state is closely allied to Dr Benson's famous Relaxation Response.

It is not uncommon for profound emotions to be released in a physical way when specific body tissues storing emotions/memories are touched by the practitioner and send messages in the form of sensations to the unconscious mind of the client. New neuropeptide combinations formed as a result of these sensations freely circulate in the body, often resulting in overwhelming feelings. This would be equivalent to the specific state of consciousness incompatible with mindfulness and sometimes associated with the spontaneous release of strong emotions described by body-centred psychotherapist Ron Kurtz in 1990. The client feels intense involvement centred on the present experience, exhibits spontaneous physical activity and temporarily has a limited capacity to think or reason. A great deal of energy is released. The client may be totally overcome with emotion such as rage, sadness, love or overwhelming pain or loss. Such feelings come in waves, often interspersed with memories (often related to early childhood) and insights.

Kurtz stresses that therapy does not stop when the client experiences the emotional release; rather, it starts there. The therapist now helps the client understand and know what to do with the experience. She/he may do this by helping the client access memories associated with it, work with the feelings that link the experience to organising beliefs, and put it into words, study it and perhaps manipulate and reorganise it. This assists the client to access self-awareness, self-regulation and healing.

Dr Pert believes that the practical experience of bodywork bringing up strong emotions and memories is direct evidence that these are stored in body tissues and is, in fact, the major piece of therapeutic information gained from her work on neuropeptides. She is a self-confessed fan of bodywork, saying that people respond to touch in a surprising way, and that body-centred approaches can be effective where talk and other therapy are not. Research has shown that the ground state of a particular receptor reflects the history of its past and affects how information flows into and out of the cell. Every receptor "remembers" how often it has been stimulated and whether it has been under- or over-stimulated.

These discoveries have led Dr Pert to discard the old model—of the brain controlling the body—and dub the body the "sub-conscious mind". She says that emotional states are altered states of consciousness, and emotions are the link between the physical and mental realms. When stored or blocked emotions are released through touch or other physical methods, there is a clearing of our internal pathways, which we experience as energy.

### BE AUTHENTIC!

According to Dr Pert, health is holistic, representing wholeness and integrity, and that while state of mind (e.g., negative thinking) probably has little or nothing to do with the aetiology of diseases

such as cancer, which she attributes largely to lifestyle factors and pollution, emotional integrity can help us fight disease. Since emotions function to unify us, they promote our integrity. It is important to let real, authentic emotions—including negative emotions such as anger—come out and be expressed. Dr Pert believes that this promotes the healing response more than anything else. When emotions are bottled up, they are literally building up pressure and may come out in an unconstructive way. She says we must learn what our true feelings are and not adopt unhealthy masks, such as false smiles.

Dr Pert regards stress as information overload—not only from the outside but also from within our body, when we are not sure which way to go. When we are stressed, we are literally becoming a waste dump for molecules of emotion. Her advice is to stop ignoring our bodies, stop living in our heads and get into movement. She says that movements of all kinds release and wash away substances that are pent-up and stored, which explains why exercise can be helpful for endogenous depression. Dr Pert advises us to be multimodal and enjoy an emotionally expressive life. Dancing, in particular, can be very effective therapy!

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